NOTES AND LITERATURE

ZOÖLOGY

Weismann's Theory of Descent.[1] — "When a life of pleasant labor is drawing towards a close the wish naturally asserts itself to gather together the main results, and to combine them in a well-defined and harmonious picture which may be left as a legacy to succeeding generations." Thus does the genial author set forth the aim and motive of his book. And no biologist can fail to be grateful for the publication of these charmingly readable lectures, presenting in two ample volumes the best thoughts of a clear and vigorous thinker. The translation into English has been admirably done.

The early chapters set forth once again the data of evolution and the most striking examples of adaptation, for many of which, in the reviewer's opinion, no other explanation so satisfactory as that of natural selection has ever been offered, and which consequently justify the further elaboration of the theory to which the book is devoted. Four more chapters present the facts of germ cells and fertilization and then the germ-plasm theory is elucidated; criticisms directed against it are answered; various accessory theories, particularly that of intragerminal selection are set forth; and finally its relation to the formation of species is fully discussed.

It is impossible in the space of a brief review to set forth Weismann's standpoint; it is unnecessary, also, for it is already well known to most naturalists. A few words may, notwithstanding, be devoted to his most recent accessory hypothesis upon which he lays the greatest possible stress, that of Germinal Selection. In attempting to explain the gradual disappearance of organs he first hit upon the hypothesis of panmixia but, however satisfactory as a factor of incipient deterioration, it became clear that panmixia could not account for complete elimination. The necessary hypothesis was found in a struggle among the organ-determining germinal particles — the determinants — due to the limitations of nutrition supplied to the germ cells. The

[1]Weismann, A. *The Evolution Theory.* Translated with the author's coöperation by J. A. & Margaret R. Thomson. London, E. Arnold, 1904. 8vo, 2 vols., xvi + 416 and 405 pp.

weaker determinants get less food, grow less well, and consequently become in turn still less capable of nutrition. Once started on the downward path the determinant descends more and more until it is wholly eliminated. Nothing can save the determinant from this fate except the elimination by natural selection of the adults of the strain possessing the deteriorating determinant — and this will only happen when the degenerating organ again becomes necessary to the welfare of the postembryonic organism.

Not only the degeneration but also the upbuilding of an organ can be explained by the hypothesis of germinal selection. For a certain strong determinant once having been selected, it will gather to itself all available nutrition at the expense of the other determinants; it will flourish in the race and will only stop its continual accretions when it produces organs so developed as to be disadvantageous to the active organism.

In criticising this hypothesis one can only admit that it explains so many facts that we hope it will some day be demonstrated. As it is, it stands to-day a bald hypothesis based on numerous probable but unproven assumptions.

Coming now to Weismann's position on the origin of the specific type we find it of interest as being clearly opposed to that of de Vries. Both theories accept the idea of unit characteristics which are represented in the germ by particles. The theories begin to diverge in respect to these particles. De Vries concludes that these particles change suddenly, probably by molecular changes within them, so that a new characteristic arises suddenly and tends thereafter to persist. The characteristic may be modified by selection, but its essential nature cannot be changed thereby. Weismann on the contrary regards these particles as being in a constant state of variation which, when continued long in one direction, will result in the elimination of a character or in its excessive development. Species are originally connected by transition forms as are to-day the terrestrial snails of the Celebes (page 299). Weismann repeatedly emphasizes the idea that all variations are quantitative and that "what appears to us a qualitative variation is, in reality, nothing more than a greater or less" (vol. 2, p. 151). Here then we have clearly set forth the issue between de Vries and Weismann: one maintains that variations of phylogenetic significance are always qualitative; the other, that they are quantitative only. This difference between the two schools would seem to be a qualitative one. But alas for the peace of mind of him who seeks clear distinctions, the quantitative may produce the qualita-

tive, as Weismann points out (vol. 2, p. 152)! He says, a cell changes its *constitution* (*i. e.* undergoes a qualitative change) when "the proportion of the component part and chemical combinations" is disturbed, "when, for instance, the red pigment-granules which were formerly present but scarcely visible increase so that the cell looks red. If there had been no red granules present, they might have arisen through the breaking up of certain other particles — of protoplasm, for instance, in the course of metabolism, so that, among other substances, red granules of uric acid or some other red stuff were produced. In this case also the qualitative change would depend on an increase or decrease of certain simpler molecules and atoms constituting the protoplasm molecule." The foregoing quotation sets forth clearly Weismann's conception of the way in which a wholly new character may arise and I imagine that de Vries would accept the hypothesis. They would differ only as to whether there was at first a great chemical change or a slight one increasing with successive generations. Thus the essential difference between de Vries and Weismann shows itself to be one of degree only.

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The Oyster.[1] — A very fascinating book presenting in a thoroughly scientific, yet in a readable and popular style the complete development and anatomy of the oyster, the possibilities of oyster culture, the cause of the decline in our oyster industry, and the remedy.

One can hardly realize that since statistics have been kept (1865), there have been taken from the Chesapeake Bay, upwards of four hundred million bushels of oysters. "This inconceivably vast amount of delicate, nutritious food has been yielded by our waters without any aid from man. It is a harvest that no man has sown; a gift from bounteous nature."

This great productiveness shows how favorable this body of water is for the oyster, and what might be done under judicial management and culture. It is doubtful if the present areas of oyster beds (about two hundred square miles) can ever regain their former prestige even if they could be utilized to the best advantage by culture. The demand has continued and will continue to outgrow the supply. The area occupied by the natural beds, however, covers but a small por-

[1] Brooks, William K. *The Oyster. A Popular Summary of a Scientific Study.* Second and revised edition, with introductions by Daniel C. Gilman and Ira Ramsen. Baltimore, Johns Hopkins Press, 1905. 12mo, 225 pp., illus.